

REMARKS

By this Amendment, Applicants have amended claims 17 and 20 to more appropriately define the invention. The Amendment is fully supported by the specification and drawings. See, e.g., paragraph [027] of the specification and Figs. 2F-2I.

In the Office Action, the Examiner objected to claim 20 as being of improper dependent form; objected to the specification for a lack of adequate explanation of the transition from Fig. 2D to Fig. 2E; rejected claims 1-11 and 13-16 under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement; and rejected claims 12 and 17-20 under 35 U.S.C. § 102(b) as anticipated by Wei (U.S. Patent No. 6,025,245).

The amendments to claims 17 and 20 overcome the objection to claim 20. Applicants therefore request that this objection be withdrawn.

In objecting to the specification and rejecting claims 1-11 and 13-16 under 35 U.S.C. § 112, first paragraph, the Examiner stated that Applicants did not explain "how an ALD process is used to form layer 64 as depicted in Fig. 2E," and asserted that "ALD is known to be a 'conformal' process." Office Action, page 3. However, contrary to the Examiner's assertion, ALD can be both conformal and non-conformal. For example, "A model for Al_2O_3 ALD conformity and deposition rate from oxygen precursor reactivity," by G. Precht et al. ("Precht"), which is submitted in an Information Disclosure Statement filed concurrently herewith, illustrates that, by controlling precursor injection time in a self-limiting ALD process, films may be formed on sidewalls of a deep trench and have different depths into the trench. See Precht, Figs. 3 and 5. One skilled in the art thus would have appreciated that an ALD process may be used to

form layer 64 as shown in Fig. 2E. Therefore, Applicants request that the objection to the specification and the rejection of claims 1-11 and 13-16 under 35 U.S.C. § 112, first paragraph, be withdrawn.

The rejection of claims 12 and 17-20 under 35 U.S.C. § 102(b) as anticipated by Wei is improper, because Wei fails to teach each and every element of these claims.

In particular, independent claim 12 recites, inter alia, “forming a trench with a lower region and an upper region in the semiconductor substrate, the trench further including sidewalls; . . . forming a collar oxide on and into the sidewalls of the trench at an intermediate region between the lower region and the upper region.” Wei fails to teach at least “forming a collar oxide on and into the sidewalls of the trench at an intermediate region between the lower region and the upper region,” as recited in claim 12. The Examiner considered Wei’s collar oxide 205 as corresponding to Applicants’ claimed “collar oxide.” Office Action at 6. However, Wei teaches that collar oxide 205 is formed on a portion of silicon substrate 201 exposed by the recess etching of TEOS oxide layer 204. See Wei, col. 3, ll. 23-29. As Fig. 3 of Wei shows, the portion of silicon substrate 201 exposed by the recess etching of TEOS oxide layer 204 is not “an intermediate region,” but rather a whole portion of semiconductor substrate 201 above TEOS oxide layer 204. Therefore, Wei fails to teach each and every element of claim 12 and claim 12 is allowable over Wei.

Moreover, independent claim 17 recites, inter alia, “a trench formed into a semiconductor substrate including a lower region and an upper region; . . . a collar oxide formed on and into sidewalls of the trench at an intermediate region between the lower region and the upper region, the collar oxide extending partially beyond the

sidewalls of the trench at the upper region.” Wei fails to teach each and every element of claim 17. Fig. 6 of Wei shows that collar oxide 205 does not extend “partially beyond” the upper region of the sidewall of the trench (not numbered). The Examiner attempted to rely on Figs. 2 and 3 of Wei and argued that Wei teaches that collar oxide 205 is also formed into the upper region of the sidewall of the trench 200. Office Action at 6.

However, trench 200 in Figs. 2 and 3 is only part of an intermediate product made by the process taught by Wei and is not the same as the trench (not numbered) shown in Fig. 6 of Wei. Relying on a combination of part of an intermediate product and part of a final product in making the anticipation rejection under 35 U.S.C. § 102(b) is improper.

Therefore, claim 17 is allowable over Wei, and claims 18-20, which depend from claim 17, are also allowable over Wei at least because of their dependence from an allowable base claim.

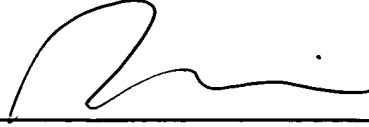
In view of the foregoing remarks, Applicants respectfully request the reconsideration and reexamination of this application and the timely allowance of the pending claims 1-20.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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By: 
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Ltd. Rec. No.: L0222